

Serial No.: 10/695,591

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**REMARKS****Claim Rejections Under 35 U.S.C. § 102**

(a) Claims 18-23 are rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Matzke *et al.* (U.S. Patent 6,096,656, "the '656 Patent").

(1) **Claim 18**

The Office Action states as follows:

Regarding Claim 18, Matzke *et al.* teach a method of fabricating a microstructure comprising: providing a substrate (18) having a sacrificial polymer layer (32) disposed thereon; disposing a framing material (20) onto at least a portion of the sacrificial polymer layer; and disposing an overcoat layer (36) onto the framing material, wherein the framing material substantially separates the sacrificial polymer layer from the overcoat layer.

*Office Action* at 2. Applicants respectfully traverse. Claim 18 recites "wherein the framing material substantially separates the sacrificial polymer layer from the overcoat." This feature is not taught or suggested by the '656 Patent. As can be seen, for example, in FIG. 3i of the '656 Patent, the encapsulating material is in contact with the trench 14 and the covering layer 20. The covering material does not substantially separate the sacrificial polymer from the overcoat layer, as recited in independent claim 18. Applicants have discovered that when the overcoat is being deposited, the solvent in the overcoat can dissolve the sacrificial material. Therefore, Applicants have substantially separated the overcoat material from the sacrificial polymer layer with the framing material. This is not taught or suggested by the '656 Patent. For at least this reason, claim 18 is allowable over the '656 Patent.

In addition, claim 18 has been amended to recite "removing the sacrificial polymer via thermal decomposition." This feature/step is also not taught or suggested by the '656 Patent. Instead, the '656 Patent dissolves the photoresist composition with a solvent. *See, e.g.*, col. 9, lines 46-54 ("the photoresist 32 can be removed from the trench 14 by immersing the substrate 18 into a solvent.... If the sacrificial material 32 comprises a photodefinable polymer, then a suitable solvent can be used to remove the polymer from the trench 14...."). No where does the '656 Patent teach or suggest removing a sacrificial polymer layer by thermal decomposition, as recited in independent claim 18. The removal of the sacrificial material via a solvent can leave behind substantial residue, and thereby require an additional de-scumming step, as taught by the

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'656 Patent. *See, e.g.*, col. 9, lines 18-21 ("An oxygen plasma cleansing step (also termed herein a "de-scum" step) can be used to remove any photoresist residue overlying the silicon oxynitride ...."). In contrast, the one-step thermal decomposition step recited in claim 18 leaves virtually no residue. The method of claim 18 can effectively eliminate the multiple steps and needless time, expense, and potentially damaging further steps by removing the sacrificial material via thermal decomposition.

Indeed, the '656 Patent teaches away from the use of heat to decompose the sacrificial polymer. For example, the '656 Patent states as follows:

*During deposition of the silicon oxynitride covering layer 20, it is important to keep the substrate temperature below about 90-100° C to prevent polymerization of the photoresist 32 ... which can make the photoresist 32 difficult to remove later. Preferably, the substrate 18 is maintained at or near room temperature ... during deposition of the covering layer 20.*

*Col. 9, lines 29-36 (emphasis added).* Thus, the '656 Patent does not anticipate claim 18; nor would have been obvious to one of skill in the art to combine the teachings of the '656 Patent with a thermally decomposable sacrificial polymer to arrive at the process of claim 18. Applicants therefore respectfully request that the rejection of claim 18 be withdrawn.

(2) *Claim 19*

The Office Action states as follows:

Regarding Claim 19, Matzke teaches removing the sacrificial layer to define an air-region within the overcoat layer, the framing material engaging at least a portion of the air-region on an inside surface of the framing material and engaging the overcoat layer on an outside surface of the framing material.

*Office Action at 2.* Applicants respectfully traverse. Claim 19 is allowable for at least the reason that it depends from independent claim 18. Applicants therefore respectfully request that the rejection of claim 19 be withdrawn.

(3) *Claim 20*

The Office Action states as follows:

Regarding Claim 20, Matzke et al teach the overcoat layer is selected from polyimides, polynorbornenes, epoxides, polyarylenes ethers, parylenes, inorganic

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glasses, and combinations thereof (Col. 9, Line 60-Col. 10, Line 2).

*Office Action* at 3. Applicants respectfully traverse. Claim 20 is allowable for at least the reason that it depends from independent claim 18.

In addition, and notwithstanding the forgoing allowability of claim 20, Applicants respectfully traverse the assertion that the '656 Patent teaches an overcoat layer of polynorbornenes, polyarylenes ethers, parylenes, or combinations thereof, as recited in claim 20. Indeed, a search of the '656 Patent reveals that the terms "polynorbornene," "polyarylene," and "parylene" do not appear any where in the '656 Patent, much less at the passages relied on by the Office.

Applicants therefore respectfully request that the rejection of claim 20 be withdrawn.

(4) *Claim 21*

The Office Action states as follows:

Regarding Claim 21, Matzke et al teach the framing material is selected from SiO<sub>2</sub>, Si<sub>3</sub>N<sub>4</sub>, SiO<sub>x</sub>N<sub>y</sub> (where x is from 0.01 to 2 and y is from 0.01 to 1.33), and AlO. (Col. 8, Lines 45-59).

*Office Action* at 3. Applicants respectfully traverse. Claim 21 is allowable for at least the reason that it depends from independent claim 18.

In addition, and notwithstanding the forgoing allowability of claim 21, Applicants respectfully traverse the assertion that the '656 Patent teaches a framing material of SiO<sub>2</sub>, Si<sub>3</sub>N<sub>4</sub>, or Al<sub>2</sub>O, as recited in claim 21. Instead, the '656 Patent refers only the covering material being a *silicon oxynitride*, particularly at the passages relied on by the Office.

Applicants therefore respectfully request that the rejection of claim 21 be withdrawn.

(5) *Claim 22*

The Office Action states as follows:

Regarding Claim 22, Matzke et al teach the sacrificial layer polymer is selected from polyimides, polynorbornenes, epoxides, polyarylenes ethers, polyarylenes, inorganic glasses, and combinations thereof. (Col. 9, Lines 4-8).

*Office Action* at 3. Applicants respectfully traverse. Claim 22 is allowable for at least the reason that it depends from independent claim 18.

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In addition, and notwithstanding the forgoing allowability of claim 22, Applicants respectfully traverse the assertion that the '656 Patent teaches a sacrificial polymer layer of polynorbornenes, epoxides, polyarylenes ethers, parylenes, inorganic glasses, or combinations thereof, as recited in claim 21. Indeed, the '656 Patent (*see, e.g.*, the passages relied on by the Office) discloses a "photodefinable polyimide" as the sacrificial mater, but does not teach or suggest a sacrificial polymer layer of polynorbornenes, epoxides, polyarylenes ethers, parylenes, inorganic glasses, or combinations thereof, as recited in claim 22.

Applicants therefore respectfully request that the rejection of claim 22 be withdrawn.

(6) *Claim 23*

The Office Action states as follows:

Regarding Claim 23, Matzke et al teach a method for fabricating a microstructure, comprising: providing a structure having a substrate, an overcoat layer, a sacrificial polymer layer in an area within the overcoat layer, and a framing material between at least a portion of the sacrificial polymer layer and the overcoat layer; and removing the sacrificial polymer layer to form an air-region within the area defined by the sacrificial material."

*Office Action* at 3. Applicants respectfully traverse. Claim 23, as amended, recites "a framing material covering all portions of the sacrificial polymer layer that would otherwise contact the overcoat layer." This feature is not taught or suggested by the '656 Patent. For at least this reason, claim 23 is allowable over the '656 Patent.

In addition, claim 23 has been amended to recite "removing the sacrificial polymer via thermal decomposition." This feature/step is also not taught or suggested by the '656 Patent. Instead, the '656 Patent dissolves the photoresist composition with a solvent. *See, e.g.*, col. 9, lines 46-54 ("the photoresist 32 can be removed from the trench 14 by immersing the substrate 18 into a solvent.... If the sacrificial material 32 comprises a photodefinable polymer, then a suitable solvent can be used to remove the polymer from the trench 14...."). No where does the '656 Patent teach or suggest removing a sacrificial polymer layer by thermal decomposition, as recited in independent claim 23. Indeed, as noted above, the '656 Patent even teaches away from the use of heat in conjunction with the sacrificial polymer. Thus, the '656 Patent does not anticipate claim 23 and Applicants therefore respectfully request that the rejection of claim 23 be withdrawn.

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(b) Claim 18-24 are rejected under 35 U.S.C.(e) as allegedly being anticipated by Matzke *et al.* (U.S. Patent No. 6,599,436, "the '436 Patent").

(1) **Claim 18**

The Office Action states as follows:

Regarding Claim 18, Matzke *et al* teach a method of fabricating a microstructure comprising: providing a substrate (12) having a sacrificial polymer layer (36) disposed thereon; disposing a framing material (38) onto at least a portion of the sacrificial polymer layer; and disposing an overcoat layer (the overcoat layer reads on the silicon dioxide barrier described at Co. 8, Lines 12-16 and/or the additional layer described at Col. 9, Lines 49-52) onto the framing material, wherein the framing material substantially separates the sacrificial polymer layer from the overcoat layer.

*Office Action* at 3. Applicants respectfully traverse. Claim 18 recites "wherein the framing material substantially separates the sacrificial polymer layer from the overcoat." This feature is not taught or suggested by the '436 Patent. For at least this reason, claim 18 is allowable over the '436 Patent.

In addition, claim 18 has been amended to recite "removing the sacrificial polymer via thermal decomposition." This feature/step is also not taught or suggested by the '436 Patent. Instead, the '656 Patent dissolves the photoresist composition with a solvent.

Applicants therefore respectfully request that the rejection of claim 18 be withdrawn.

(2) **Claim 19**

The Office Action states as follows:

Regarding Claim 19, Matzke teaches removing the sacrificial layer (36) to define an air-region within the overcoat layer (Figure 31), the framing material engaging at least a portion of the air-region on an inside surface of the framing material and engaging the overcoat layer on an outside surface of the framing material.

*Office Action* at 3. Applicants respectfully traverse. Claim 19 is allowable for at least the reason that it depends from independent claim 18. Applicants therefore respectfully request that the rejection of claim 19 be withdrawn.

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**(3) Claim 20**

The Office Action states as follows:

Regarding Claim 20, Matzke et al teach the overcoat layer is selected from polyimides, polynorbornenes, epoxides, polyarylenes ethers, parylenes, inorganic glasses, and combinations thereof.

*Office Action* at 4. Applicants respectfully traverse. Claim 20 is allowable for at least the reason that it depends from independent claim 18.

In addition, and notwithstanding the forgoing allowability of claim 20, Applicants respectfully traverse the assertion that the '436 Patent teaches an overcoat layer of polynorbornenes, polyarylenes ethers, parylenes, or combinations thereof, as recited in claim 20. Indeed, a search of the '656 Patent reveals that the terms "polynorbornene," "polyarylene," and "parylene" do not appear any where in the '436 Patent. In addition, the Office offers no passages of the '436 Patent at all that are relied on by the Office to reject claim 20.

Applicants therefore respectfully request that the rejection of claim 20 be withdrawn.

**(4) Claim 21**

The Office Action states as follows:

Regarding Claim 21, Matzke et al teach the framing material is selected from  $\text{SiO}_2$ ,  $\text{Si}_3\text{N}_4$ ,  $\text{SiO}_x\text{N}_y$  (where x is from 0.01 to 2 and y is from 0.01 to 1.33), and  $\text{Al}_2\text{O}_3$ . (Col. 8, Line 60-Col. 9, Line 6).

*Office Action* at 4. Applicants respectfully traverse. Claim 21 is allowable for at least the reason that it depends from independent claim 18.

In addition, and notwithstanding the forgoing allowability of claim 21, Applicants respectfully traverse the assertion that the '436 Patent teaches a framing material of  $\text{SiO}_2$ ,  $\text{Si}_3\text{N}_4$ , or  $\text{Al}_2\text{O}_3$ , as recited in claim 21. Instead, the '436 Patent refers only the covering material being a *silicon oxynitride*, particularly at the passages relied on by the Office.

Applicants therefore respectfully request that the rejection of claim 21 be withdrawn.

**(5) Claim 22**

The Office Action states as follows:

Regarding Claim 22, Matzke et al teach the sacrificial layer polymer is selected from polyimides (Col. 7, Lines 1-5), polynorbornenes, epoxides, polyarylenes

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ethers, polyarylenes, inorganic glasses, and combinations thereof. (Col.)

*Office Action* at 4. Applicants respectfully traverse. Claim 22 is allowable for at least the reason that it depends from independent claim 18.

In addition, and notwithstanding the forgoing allowability of claim 22, Applicants respectfully traverse the assertion that the '436 Patent teaches a sacrificial polymer layer of polynorbornenes, epoxides, polyarylenes ethers, parylenes, inorganic glasses, or combinations thereof, as recited in claim 21. Although, the '436 Patent discloses a "photodefinable polyimide" as the sacrificial matter (*see, e.g.*, the passage at col. 7, lines 1-5 relied on by the Office), it does not teach or suggest a sacrificial polymer layer of polynorbornenes, epoxides, polyarylenes ethers, parylenes, inorganic glasses, or combinations thereof, as recited in claim 22. In addition, the Office offers no passages of the '436 Patent at all that are relied on by the Office to reject claim 20.

Applicants therefore respectfully request that the rejection of claim 22 be withdrawn.

(6) *Claim 23*

The Office Action states as follows:

Regarding Claim 23, Matzke et al teach a method for fabricating a microstructure, comprising: providing a structure having a substrate (12), an overcoat layer (Col. 8, Lines 12-16 and/or Col. 9, Lines 49-52), a sacrificial polymer layer in an area within the overcoat layer, and a framing material (38) between at least a portion of the sacrificial polymer layer and the overcoat layer; and removing the sacrificial polymer layer (36) to form an air-region within the area defined by the sacrificial material.

*Office Action* at 4. Applicants respectfully traverse. Claim 23, as amended, recites "a framing material covering all portions of the sacrificial polymer layer that would otherwise contact the overcoat layer." This feature is not taught or suggested by the '436 Patent. For at least this reason, claim 23 is allowable over the '436 Patent.

In addition, claim 23 has been amended to recite "removing the sacrificial polymer via thermal decomposition." This feature/step is also not taught or suggested by the '436 Patent. Instead, the '436 Patent dissolves the photoresist composition with a solvent. No where does the '436 Patent teach or suggest removing a sacrificial polymer layer by thermal decomposition, as recited in independent claim 23. Indeed, as noted above, the '436 Patent even teaches away from

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the use of heat in conjunction with the sacrificial polymer. Thus, the '436 Patent does not anticipate claim 23 and Applicants therefore respectfully request that the rejection of claim 23 be withdrawn.

(7) **Claim 24**

The Office Action states as follows:

Regarding Claim 24, Matzke et al inherently teaches that the polymer sacrificial layer is solvent-incompatible with the overcoat since the solvent in the sacrificial polymer removal step removes only the sacrificial layer. Further, since Matzke et al suggests widely different materials with respect to solvency (glass, plastic, metal) for the sacrificial layers and overcoat the different material are clearly "solvent incompatible" as broadly claimed by applicant."

*Office Action* at 4. Applicants respectfully traverse. Claim 24 is allowable for at least the reason that it depends from independent claim 23.

In addition, and notwithstanding the forgoing allowability of claim 24, the '436 Patent does not teach or suggest the sacrificial layer polymer being solvent-incompatible with the overcoat, as recited in claim 24. Applicant traverses the assertion that this feature is inherently taught by the '436 Patent, and that the different materials are "clearly 'solvent incompatible'," as alleged by the Office. The Office offers no justifications or teachings in the art to suggest this is so. As argued above with respect to claims 20 and 22, the overcoat material and the sacrificial polymers claimed by Applicants are not all anticipated by the teachings of the '436 material. Therefore, it is inherent that Applicants can pick and choose among their disclosed overcoat materials and the sacrificial polymers to arrive at materials that are solvent incompatible. This is not taught or suggested by the '436 Patent and Applicants respectfully request that the rejection be withdrawn.

Newly Added Claims

Claims 25-31 have been newly added to further define and/or clarify the scope of the invention. No new matter has been added. Claims 25-31 are allowable for at least the reason that claims 25-31 ultimately depend from claims 18 or 23, which are allowable for the reasons noted above. In addition, new claims 25-31 should be interpreted independent of the existing claims, based exclusively upon the new claims own features/elements/steps.

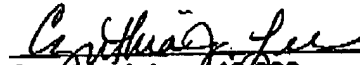


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**CONCLUSION**

In light of the foregoing amendments and for at least the reasons set forth above, Applicants respectfully submit that all rejections have been traversed, rendered moot, and/or accommodated, and that the now pending claims 18-31 are in condition for allowance. Favorable reconsideration and allowance of the present application and all pending claims are hereby courteously requested. If, in the opinion of the Examiner, a telephone conference would expedite the examination of this matter, the Examiner is invited to call the undersigned attorney at (770) 933-9500.

Respectfully submitted,

  
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